Visualization and analysis of financial transaction networks - a multidimensional modeling approach

Zoltán Németh

In recent years network analysis and visualization has become an important concept in the growing field of business intelligence researches and applications. Through data mining methods, modeling customer value and behavior based on an abundance of data were already widely used during the last decade. Interest in customer relationships has increased particularly in telecommunications and banking industry since then, as efficient methods provided by the emerging network science paired with sufficient computing capacity has proven to be able to handle transactional data from a network perspective.

The operation of a particular business area represented by different entities and relations may be visualized and analyzed for palpable business benefits [1]. In this paper we focus mainly on financial transactions on an institutional level, using local data warehouses, data marts as standard data sources. Assuming a sales, risk or churn analysis perspective, relying on local business knowledge and additional steps of ensuring a proper level of data quality are to be considered in order to model and process transactional relationships resulting in money transfers. Types of the network units are defined aiming for relatively simple structures and flexibility, always considering both the benefits and limits of the end-users' ability of perceiving and processing visual information.

Core aims of this research are expanding and enhancing application development aspects, on the basis of our past research and development experience in displaying a browseable part of a network, and leaning on the analysis toolbox of network science, recognizing the importance of environmental statistics or path and pattern search algorithms. Apart from a constant need for improved performance, programability and scalability in such applications, added functionality can be produced by investigating and incorporating best practices in existing widely popular BI solutions such as on-line analytical processing. While table-based, normalized storage of nodes and edges represent big challenge for the network approach, data modeling has evolved through the years with new technologies and tools. Recognizing the fallbacks and limited effectiveness of prior attempts a different approach is proposed: applying multidimensional models in back-end components that are highly optimized to query performance and have flexible ways of defining business context. As we are mainly focusing on cost-effective solutions, designing an effective caching strategy and aggregation scheme is an essential step in creating such a data layer, while in-memory engine benefits and drawbacks need to be evaluated, and recent improvements in tabular modelling options are also examined. Furthermore, possible parallel solutions, filtering and ranking options are discussed regarding the business logic layer algorithms.

Keywords: network visualisation, financial transaction, multidimensional data model

References

[1] Cser, L. (ed.) (2013) Business value in an ocean of data, Budapest: Alinea.